General

Guideline Title

Venous thromboembolism prophylaxis.

Bibliographic Source(s)

Jobin S, Kalliainen L, Adebayo L, Agarwal Z, Card R, Christie B, Haland T, Hartmark M, Johnson P, Kang M, Lindvall B, Mohsin S, Morton C. Venous thromboembolism prophylaxis. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2012 Nov. 51 p. [22 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Institute for Clinical Systems Improvement (ICSI). Venous thromboembolism prophylaxis. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2011 Sep. 47 p.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC) and the Institute for Clinical Systems Improvement (ICSI): For a description of what has changed since the previous version of this guidance, refer to Summary of Changes Report – November 2012 . In addition, in 2011, ICSI has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. This document is in transition to the GRADE methodology. Transition steps incorporating GRADE methodology for this document include the following:

- Priority placed upon available systematic reviews in literature searches.
- All existing Class A (randomized controlled trials [RCTs]) studies have been considered as high quality evidence unless specified differently by a work group member.
- All existing Class B, C and D studies have been considered as low quality evidence unless specified differently by a work group member.
- All existing Class M and R studies are identified by study design versus assigning a quality of evidence. Refer to Crosswalk between ICSI Evidence Grading System and GRADE (see below in the "Definitions" section).
- All new literature considered by the work group for this revision has been assessed using GRADE methodology.

The recommendations for venous thromboembolism prophylaxis are presented in the form of a Recommendation Summary accompanied by detailed annotations. Clinical highlights, the Recommendation Summary, and selected annotations follow.

Class of evidence (Low Quality, Moderate Quality, High Quality, Meta-analysis, Systematic Review, Decision Analysis, Cost-Effectiveness Analysis, Guideline, Reference) ratings are defined at the end of the "Major Recommendations" field.

Clinical Highlights

- All patients should be evaluated for venous thromboembolism (VTE) risk upon hospital admission, change in level of care, clinicians, and prior to discharge. *(Recommendation Summary A; Annotation #1)*
- All patients should receive proper education regarding VTE risk, signs and symptoms, early and frequent mobilization, and clinically appropriate treatment/prophylaxis methods. *(Recommendation Summary A; Annotation #1)*
- All hospitalized patients who are high risk for VTE should receive pharmacologic thromboprophylaxis unless contraindicated. *(Recommendation Summaries B and C)*
- For all patients receiving spinal or epidural anesthesia, precautions should be taken when using VTE prophylaxis to reduce the risk of epidural perispinal hematoma. *(Recommendation Summary F; Annotation #9)*

Thromboembolic Prophylaxis for Adult Hospitalized Patients Recommendation Summary

A. General Recommendations
   - All patients should have VTE risk assessed and addressed upon hospital admission, change in level of care, and discharge.
   - All patients should have proper education regarding VTE risk, signs and symptoms, and treatment/prophylaxis methods available.
   - All patients should be encouraged to ambulate as early as possible, and as frequently as possible.
   - All patients with moderate to high risk of VTE should have pharmacologic prophylaxis based on the recommendations in this guideline – unless contraindicated. If pharmacologic therapy is contraindicated, then mechanical prophylaxis with intermittent pneumatic compression (IPC) is recommended.

B. Hospitalized Medical (Non-Surgical) Patients Recommended Assessment and Prophylaxis
   Assessment

   Padua VTE Risk Assessment

   Hospitalized medical patients who are not critically ill, hence not at high VTE risk, should be assessed for VTE risk in order to guide choices for prophylaxis *[Guideline]*.

   There are several models available for estimating VTE risk *[Low Quality Evidence]*. While none has been extensively validated, the Padua Prediction Score was validated in a prospective cohort study *[Moderate Quality Evidence]* and is easy to use.

Padua Risk Assessment Model* RAM Score greater than or equal to 4 = High risk of VTE	
Points	Condition
3	CA, past VTE, not mobile, thrombophilic condition
2	Trauma or surgery in past month
1	70 years or older, CHF, AMI, ischemic CVA, BMI greater than or equal to 30, hormones, other*

   *Acute infections or rheumatologic disorder

   AMI = acute myocardial infarction; BMI = body mass index; CA = active cancer; CHF = congestive heart failure; CVA = cerebrovascular accident; RAM = risk assessment model; VTE = venous thromboembolism

   Prophylaxis

	Low Bleed Risk	High Bleed Risk	Duration
Low Risk	Prophylaxis not required	Prophylaxis not required	Not Applicable

High Risk	Low Bleeding Risk Pharmacoprophylaxis	High Bleeding Risk Intermittent pneumatic compression	Duration Until discharge

May use aspirin for other indications, but not sufficient alone for VTE prophylaxis.

If on warfarin for other indications, probably sufficient VTE prophylaxis.

C. Hospitalized Surgical Patients Recommended Assessment and Prophylaxis
Assessment

Caprini VTE Risk Assessment for Use in Hospitalized Surgical Patients

Surgical patients should be assessed for VTE risk. Several risk assessment models exist, although none has been prospectively validated *[Guideline]*. The ICSI work group suggests using the Caprini Risk Assessment Model as a guide for decision-making *[Low Quality Evidence]*. It is relatively easy to use, and it has been retrospectively validated in general, vascular and urological surgery patients *[Moderate Quality Evidence]*, and in plastic and reconstructive surgery patients *[Moderate Quality Evidence]*.

Refer to the original guideline document for thrombosis risk factor assessment.

If contraindications exist for both low-molecular-weight heparin (LMWH) and low dose unfractionated heparin (LDUH), and there is high risk for VTE but not high risk for major bleeding, use fondaparinux or low-dose aspirin, or intermittent pneumatic compression.

VTE risk category is based on the Caprini Risk Assessment Model.

Inferior vena cava filter (IVCF) is not recommended for any of the risk categories.

Periodic surveillance venous compression ultrasonography is not recommended for any of the risk categories.

Prophylaxis

Non-orthopedic General, and Abdominal Pelvic Surgery Including Gastrointestinal (GI), Genitourinary (GU), Bariatric, Vascular, Reconstructive, Cardiothoracic and Gynecologic (GYN) Surgery Hospitalized Surgical Patients

	Low Bleeding Risk	High Risk for Major Bleeding
VTE Risk Category		
Very Low Risk (Caprini score 0)	Early ambulation	Early ambulation
Low Risk (Caprini score 1-2)	Intermittent pneumatic compression (IPC)	Intermittent pneumatic compression
Moderate Risk (Caprini score 3-4)	LMWH or LDUH or intermittent pneumatic compression	Intermittent pneumatic compression
High Risk (Caprini Score ≥5)	LMWH or LDUH and intermittent pneumatic compression	Intermittent pneumatic compression until risk of bleeding diminishes and pharmacologic thromboprophylaxis can be initiated
Cancer Surgery (visceral cancer)	LMWH Extended duration (four weeks) if no risk for major bleeding	

LDUH = low dose unfractionated heparin; LMWH = low-molecular-weight heparin

Hip/Knee Arthroplasty, Hip Fracture

	Standard Bleeding Risk	Elevated Bleeding Risk
Standard VTE Risk	Pharmacoprophylaxis and intermittent pneumatic compression prophylaxis	Intermittent pneumatic compression prophylaxis
Elevated VTE Risk	Pharmacoprophylaxis and intermittent pneumatic compression prophylaxis	Intermittent pneumatic compression, consider pharmacoprophylaxis in select patients

For pharmacoprophylaxis recommend minimum duration 10 to 14 days, consider extension to 35 days.

D. Risk Factors for Major Bleeding Complications
General Risk Factors

- Active bleeding
- Previous major bleeding
- Known untreated bleeding disorder
- Severe renal or hepatic disorder
- Thrombocytopenia
- Acute stroke
- Uncontrolled systemic hypertension
- Lumbar puncture, epidural or spinal anesthesia within previous 4 hours or next 12 hours
- Concomitant use of anticoagulants, antiplatelet therapy or thrombolytic agents

Procedure Specific Risk Factors

Abdominal Surgery

- Male sex
- Preoperative hemoglobin (Hgb) <13 g/dL
- Malignancy and complex surgery defined as two or more procedures, difficult dissection or more than one anastomosis

Pancreaticoduodenectomy

- Sepsis
- Pancreatic leak
- Sentinel bleed

Hepatic Resection

- Number of segments
- Concomitant extra hepatic organ resection
- Primary liver malignancy
- Lower preoperative Hgb level and platelet counts

Procedures with High Risk

- Craniotomy
- Spinal surgery
- Spinal trauma
- Reconstructive surgery involving free flap

E. Heparin-Induced Thrombocytopenia (HIT)
History of HIT, Thrombocytopenia, Coagulopathy

- Use mechanical prophylaxis and consult an anticoagulation expert to discuss options for pharmacoprophylaxis

Monitoring for HIT

- Medical patient with HIT risk 0.1% to 1% receiving prophylactic-dose UFH or receiving LMWH after first receiving UFH and

postoperative patients with HIT risk >1% receiving prophylactic-dose UFH or with HIT risk >0.1% to 1% receiving LMWH or UFH intravascular catheter flushes.

Protocol

- Obtain baseline platelet count; then monitor platelets every two days from day 4 through 14, or until the UFH is stopped, whichever occurs first.
- Patients who have received UFH within the past 100 days or those patients in whom exposure is uncertain – start monitoring platelets within 24 hours of starting UFH or LMWH.

Patients Who Received UFH/LMWH within 100 Days or Patients with Uncertain Exposure

Protocol

- Obtain baseline platelet count; then monitor platelets within 24 hours of starting UFH or LMWH. Continue monitoring every 2 days until day 14 or until UFH/LMWH has been stopped, whichever occurs first.
- Platelet monitoring not required for medical patient with HIT risk <0.1% receiving only LMWH or UFH intravascular catheter flushes or patient receiving fondaparinux.

F. Neuraxial Blockade in Patients Receiving Prophylactic Antithrombotic Therapy

Rivaroxaban	Dalteparin or Enoxaparin	Fondaparinux	Unfractionated Heparin	Warfarin
• Insertion – at least 18 hours after the last dose • Removal – at least 18 hours after last dose • Subsequent dose at least 6 hours after catheter insertion or removal • If traumatic puncture occurs, delay administration for 24 hours	Prophylactic dose, single-daily dosing: • Insertion – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter insertion • Removal – at least 12 hours after the last dose. Subsequent dose at least 4 hours after catheter removal Prophylactic dose, twice-daily dosing: • Insertion – epidural catheter not recommended • Removal – may initiate twice-daily dosing at least 4 hours after catheter removal	• Insertion – fondaparinux not recommended prior to insertion • Removal – at least 36 hours after the last dose of fondaparinux • Subsequent dose at least 12 hours after catheter removal	• Insertion – at least 4 hours after the last dose of unfractionated heparin • Removal – at least 4 hours after the last dose of unfractionated heparin • Dose subsequent at least 1 hour after catheter removal	• Insertion – no consensus regarding highest acceptable international normalized ratio (INR) • Removal – within 48 hours of initiation of warfarin and INR <1.5

Annotations

1. General Recommendations
   Ambulation

   Specific studies have yet to document the value of early ambulation to reduce VTE risk, yet the ICSI work group recommends it for all patients, including those at high risk.

   Patient Education

   The impact of providing patient education about compliance with VTE prevention through pharmacologic thromboprophylaxis has been studied *[Low Quality Evidence]*. Improved patient compliance was demonstrated with pharmacist-led education. Additional information regarding patient education is contained in the Implementation Recommendations section of the original guideline document.

Recommendations for Mechanical Prophylaxis

Mechanical thromboprophylaxis devices include graduated compression stockings (GCS) and intermittent pneumatic compression (IPC) devices. GCS are specialized hosiery that provide graduated pressure on the lower legs and feet to help prevent thrombosis. GCS use stronger elastics to create significant pressure on the legs, ankles and feet. GCS should be tightest at the ankles and gradually become less constrictive towards the knees and thighs. Though routinely used, there is little evidence supporting the efficacy of GCS in the prevention of VTE.

Although mechanical prophylaxis devices have been evaluated extensively in clinical studies, their efficacy in VTE prevention remains unclear. These studies have often failed to define exactly what device was used. Frequently the devices were used in combination with other prophylaxis methods, making it difficult to demonstrate their efficacy.

Mechanical prophylaxis devices can have harmful consequences, most commonly related to skin irritation and breakdown.

3. Hospitalized Non-Surgical (Medical) Patients
Early ambulation by medical patients, and the use of mechanical devices may be useful.

For hospitalized acutely ill medical patients the 2012 American College of Chest Physicians (ACCP) Clinical Practice Guideline recommends the following *[Guideline]*:

- For acutely ill hospitalized medical patients at low risk of thrombosis, the ACCP recommends against the use of pharmacologic thromboprophylaxis or mechanical thromboprophylaxis.
- For acutely ill hospitalized medical patients who are bleeding or at high risk for bleeding, the ACCP recommends against pharmacologic thromboprophylaxis.
- For acutely ill hospitalized medical patients at increased risk of thrombosis who are bleeding or at high risk for major bleeding, the ACCP suggests the optimal use of mechanical thromboprophylaxis with GCS or IPC, rather than no mechanical thromboprophylaxis. When the bleeding risk decreases, and if VTE risk persists, the ACCP suggests that pharmacologic thromboprophylaxis be substituted for mechanical thromboprophylaxis. Patients are likely to decline mechanical prophylaxis if they are particularly susceptible to the potential for skin complications, averse to cost and have a need for clinical monitoring of GCS and IPC.
- In critically ill patients who are bleeding or are at high risk for major bleeding, the ACCP suggests mechanical thromboprophylaxis with IPC until the bleeding risk decreases, rather than no mechanical thromboprophylaxis. When bleeding risk decreases, the ACCP suggests that pharmacologic thromboprophylaxis be substituted for mechanical thromboprophylaxis.

Aspirin Use

Aspirin for deep vein thrombosis (DVT) prophylaxis appears to be minimally effective.

Effect of low-dose aspirin on the occurrence of VTE data suggests long-term, low-dose aspirin treatment has little effect on the prevention of VTE in initially healthy women *[High Quality Evidence]*. While this study was on an ambulatory population, it implies aspirin would not be effective.

The majority of studies have been done on surgical patients; there is no conclusive evidence for medical patients.

Heparin Duration

The optimal duration of heparin prophylaxis is uncertain. At least one study evaluated extended (posthospitalization) heparin therapy for high-risk (immobile) patients, but the study had some methodologic limitations. More research on the balance of benefits and harms is needed to understand the effects of extended therapy beyond hospitalization *[Low Quality Evidence]*.

5. Recommended Prophylaxis for Non-Orthopedic General and Abdominal Pelvic Surgery Including Gastrointestinal (GI), Urological, Bariatric, Vascular, Plastic or Reconstructive, Cardiothoracic and Gynecologic Surgery
General and Abdominal Pelvic Gastrointestinal, Urologic, Gynecologic, Bariatric, Vascular, Plastic, Reconstructive Surgery

For patients undergoing general, GI, urological, gynecologic, bariatric, vascular, plastic or reconstructive surgery, the 2012 American College of Chest Physicians Clinical Practice guideline recommends the following *[Guideline]*:

- For patients at very low risk for VTE (Caprini score, 0), recommend no specific pharmacologic or mechanical thromboprophylaxis be used other than early ambulation.
- For patients at moderate risk for VTE (Caprini score, 3-4) who are at high risk for major bleeding complications are thought to be particularly severe, suggest mechanical thromboprophylaxis, preferably with IPC, over no prophylaxis.

- For patients at high risk for VTE (Caprini score, >5) who are not at high risk for major bleeding and for whom complications are thought to be particularly severe, recommend pharmacologic thromboprophylaxis with LMWH or LDUH over no prophylaxis. It is suggested that mechanical thromboprophylaxis with IPC should be added to pharmacologic thromboprophylaxis.
- For high-VTE-risk patients who are at high risk for major bleeding complications or those in whom the consequences of bleeding are thought to be particularly severe, suggest the use of mechanical thromboprophylaxis, preferably with IPC, over no prophylaxis until the risk of bleeding diminishes and pharmacologic thromboprophylaxis may be initiated.
- For patients at high risk for VTE (Caprini score, >5) in whom both LMWH and UFH are contraindicated or unavailable and who are not at high risk for major bleeding complications, suggest low-dose aspirin, fondaparinux or mechanical prophylaxis, preferably with IPC over no prophylaxis.

Cardiac Surgery

For cardiac patients with an uncomplicated postoperative course, the ACCP suggests the use of mechanical thromboprophylaxis, preferably with optimally applied IPC, over either no thromboprophylaxis or pharmacologic thromboprophylaxis. For cardiac surgery patients whose hospital course is prolonged by one or more nonhemorrhagic surgical complication, it is suggested adding pharmacologic thromboprophylaxis with LDUH or LMWH to mechanical thromboprophylaxis *[Guideline]*.

Thoracic Surgery

For thoracic surgery patients at moderate risk for VTE who are not at high risk for perioperative bleeding, the ACCP guideline suggests LDUH, LMWH or mechanical thromboprophylaxis with optimally applied IPC over no prophylaxis. For thoracic surgery patients at high risk for VTE who are not at high risk for perioperative bleeding, the guideline suggests LDUH or LMWH over no prophylaxis. In addition, it is suggested that mechanical thromboprophylaxis with IPC be added to pharmacologic thromboprophylaxis. For thoracic surgery patients who are at high risk for major bleeding, it is suggested that mechanical prophylaxis, preferably with optimally applied IPC, over no prophylaxis be used until the risk of bleeding diminishes and pharmacologic prophylaxis may be initiated *[Guideline]*.

Major Outpatient Procedures, Laparoscopic

The shift from inpatient to outpatient procedures has resulted in the need to assess VTE risk identification and treatment considerations in the outpatient setting. Although work is being done to identify outpatients at risk for VTE (e.g., patients with fractures and surgical patients with multiple comorbidities) and potential treatment methodologies, the body of work is insufficient to make recommendations at this time *[Low Quality Evidence]*.

6. Hip/Knee Arthroplasty, Hip Fracture

Since the last edition of the ICSI Venous Thromboembolism Prophylaxis guideline, both the ACCP and the American Academy of Orthopaedic Surgeons (AAOS) have published new guidelines for patients undergoing hip and knee arthroplasty procedures. The ACCP guidelines specifically address the hip fracture surgery patient population, as well. Although the AAOS guidelines do not specifically address the hip fracture surgery population, the ICSI work group feels it is reasonable to apply this guideline for hip and knee arthroplasty patients to those undergoing hip fracture surgery as well. Both of these guidelines differ substantially from previous editions. One of the most substantial differences is the change in the ACCP guideline to no longer recommend against the use of aspirin as pharmacologic thromboprophylaxis in these patient groups. The 2011 edition of this ICSI guideline was published when the previous ACCP guideline specifically recommending against the use of aspirin was in effect. The following, therefore, will discuss in broader terms the ACCP and AAOS recommendations contained in their most recent guidelines *[Guideline]*.

Risk Stratification

When evaluating patients undergoing hip/knee arthroplasty or hip fracture surgery, it is important to realize that these patients are, by definition, at high risk for VTE events. There is consensus on this. However, the concept that certain patients are at even higher risk is put forth in the AAOS guidelines. Despite conditions that have been regarded as VTE risk factors in the past, or in other patient populations, the AAOS recognizes only a history of prior VTE as a VTE risk factor. The ACCP does not comment on additional VTE risk factors, essentially treating all patients in these groups as having the same VTE risk (high).

Recommendations for prophylaxis may also vary based on a particular patient's perceived risk of bleeding. The AAOS recognizes patients with "a known bleeding disorder and/or active liver disease" as being at increased risk for bleeding. Again, despite conditions that may have been regarded as risk factors for bleeding in the past, or in different patient populations, only a known bleeding disorder and/or active liver disease are currently considered risk factors under the AAOS guideline. The ACCP guideline is even more vague. It does address the patient population with "increased risk of bleeding" but does not elaborate on what specific conditions constitute an "increased risk of bleeding."

Recommendations

Despite the paucity of specific identified VTE or bleeding risk factors in both documents, the ICSI work group believes it is useful to separate these patients into four different groups related to their risk of VTE and bleeding:

- Standard bleeding risk with standard VTE risk
- Standard bleeding risk with elevated VTE risk
- Elevated bleeding risk with standard VTE risk
- Elevated bleeding risk with elevated VTE risk

Prophylaxis recommendations are provided for each specific group. Neither the AAOS nor the ACCP guidelines comment on patients with both an increased bleeding risk AND an increased VTE risk. The ICSI work group feels that these patients should all receive mechanical thromboprophylaxis. The decision regarding pharmacologic thromboprophylaxis should be addressed on a case-by-case basis with guidance from individuals with extensive knowledge of the specific VTE and bleeding risk factors for each individual patient.

As for selecting the type of pharmacologic thromboprophylaxis, the 2012 AAOS guideline states, "Current evidence is unclear about which prophylactic strategy (or strategies) is/are optimal." Therefore, the ICSI work group is unable to recommend for or against specific prophylactics in these patients. The ACCP recommends low-molecular-weight heparin (LMWH), fondaparinux, low-dose unfractionated heparin, adjusted-dose vitamin K antagonists, or aspirin as options for hip fracture surgery patients. For hip/knee arthroplasty patients, all the above plus apixaban, dabigatran and rivaroxaban are given as options *[High Quality Evidence]*. The ACCP also suggests LMWH "in preference to the other agents" in both hip/knee arthroplasty patients and hip fracture surgery patients.

As for the duration of prophylaxis, ACCP recommends a minimum of 10-14 days and suggests extending prophylaxis for "up to 35 days." The AAOS simply recommends that "patients and physicians discuss the duration of prophylaxis."

Much work remains to be done in this area. Many of the recommendations made by both the ACCP and the AAOS have low levels of evidence to support them. The ICSI VTE Prophylaxis work group feels that the recommendations provided represent a reasonable approach to VTE prophylaxis in this patient population based on the best currently available research data and expert opinion.

7. Risk Factors for Major Bleeding Complications
   Recommendation:

   - Each patient and procedure should be evaluated for risk of bleeding.

   Bleeding Risk Table Annotation

   The Summary of Recommendations section (see above) identifies risk factors for major bleeding complications. It includes general risk factors, procedure-specific risk factors, as well as procedures in which bleeding complications may have especially severe consequences. Information presented in the Recommendations Summary D, can be used as a guide to help identify patients in whom the risk of bleeding is high or the consequences of bleeding are especially severe.

   Certain situations and/or low-risk procedures lend themselves to bleeding and therefore may require only early ambulation or IPC devices for VTE prophylaxis *[Guideline]*.

   See the original guideline document for more information on risk factors for major bleeding.

8. Heparin-Induced Thrombocytopenia
   Heparin-induced thrombocytopenia (HIT) is a potential side effect of heparin and LMWH therapy. Postoperative patients and patients receiving UFH are at the highest risk of developing this complication. Refer to the Summary of Recommendations section for guidelines on monitoring for HIT *[Guideline]*, as well as prophylaxis recommendations for those with HIT, thrombocytopenia coagulopathy.

9. Neuraxial Blockade in Patients Receiving Prophylactic Antithrombotic Therapy
   Recommendations:

   - Closely monitor all patients who receive neuraxial blockade for developing back pain or signs and symptoms of spinal cord compression (weakness, saddle numbness, numbness, incontinence) after injections, during infusions and after discontinuation of infusions.
   - Both insertion and removal of neuraxial catheters are significant events. Carefully consider the timing of those events and the timing of any anticoagulation drugs. Take into account the pharmacokinetics and pharmacodynamics of the specific anticoagulant drugs.
   - The emergence of new drugs and unexpected clinical scenarios can render any guideline obsolete. Consult an anesthesiologist who is experienced in regional anesthesia; it is essential for novel situations.

- The American Society of Regional Anesthesia and Pain Medicine (ASRA) has developed extensive, peer-reviewed guidelines for the practice of regional anesthesia in the presence of anticoagulation, and they can be used for detailed management. Review these guidelines directly at http://www.asra.com/publications-anticoagulation-3rdedition-2010.php . *[Guideline]*

Neuraxial blockade is not a contraindication for pharmacologic thromboprophylaxis. It is important to consider the use and timing of medications with neuraxial blockade. When an epidural is used for anesthesia, it is most appropriate to wait until the catheter is removed before starting pharmacologic thromboprophylaxis. Neuraxial blockade should generally be avoided in patients with a clinical bleeding disorder.

Neuraxial blockade (spinal or epidural anesthesia) is a valuable tool for both anesthesiologists and surgeons. The Cochrane Reviews and other sources have listed the usefulness of neuraxial blockade for both intraoperative anesthesia and postoperative analgesia. There are groups of patients that demonstrate improved morbidity and mortality with the use of regional rather than general anesthesia. Similarly, the usefulness of VTE prophylaxis in preventing morbidity and mortality in surgical patients has been well established. However, there is concern about an increased risk of perispinal hematoma in patients receiving antithrombotic medications for venous thromboembolism prophylaxis in the setting of neuraxial blockade. Perispinal hematoma is a rare but serious complication of neuraxial blockade. Thus, it is important to consider both the use and the timing of antithrombotic medications in these patients.

[Low Quality Evidence]

Pharmacologic Thromboprophylactic Agents and Neuraxial Blockade

1. Subcutaneous UFH (5,000 units twice daily):
   It is acceptable to place and maintain epidural catheters in patients on subcutaneous UFH. Dosing should be such that the activity of the last dose is near its nadir. Epidural placement should be prior to starting the regimen or at least four hours after the last dose. When discontinuing the epidural catheter, an interval of at least four hours should have transpired since the last dose, and the next heparin dose should be given no sooner than one hour after pulling the catheter.

   Subcutaneous UFH (5,000 units three times daily):

   According to the ASRA guidelines, the safety of neuraxial blockade in patients receiving doses greater than 10,000 units of UFH daily or more than twice-daily dosing of UFH has not been established. Although the use of thrice-daily UFH may lead to an increased risk of surgical-related bleeding, it is unclear whether there is an increased risk of spinal hematoma. The ASRA guidelines suggest that the risk and benefits of thrice-daily UFH be assessed on an individual basis and that techniques to facilitate detection of new/progressive neurodeficits (e.g., enhanced neurologic monitoring occur and neuraxial solutions to minimize sensory and motor block) be applied *[Guideline]*.

2. LMWH:
   Patients on preoperative thromboprophylaxis can be assumed to have altered coagulation. Needle placement in these patients should occur at least 12 hours after the last dose of LMWH. In patients receiving higher (treatment) doses of LMWH such as enoxaparin 1 mg/kg every 12 hours or 1.5 mg/kg daily, dalteparin 120 u/kg every 12 hours, or dalteparin 200 u/kg daily, epidural needle placement is not recommended. For general surgery patients who have received a dose of LMWH four hours preoperatively, neuraxial techniques are not recommended because needle placement would occur during peak anticoagulation activity.

3. Fondaparinux:
   Inadequate data exist at this time regarding the maintenance of epidural catheters while employing this agent. Early data suggest that holding fondaparinux for 36 hours may allow safe epidural catheter removal. However, additional study is necessary before this can be endorsed. Currently, it is recommended that the epidural catheter be removed prior to initiating thromboprophylaxis with this drug.

4. Warfarin:
   The ASRA guideline recommends that caution be used when performing neuraxial techniques in patients recently discontinued from long-term warfarin therapy. Although no studies have directly examined the risk of procedure-related bleeding and the INR in patients recently discontinued from warfarin, careful consideration should be given before performing neuraxial blocks in these patients. This recommendation is based on general agreement on efficacy from observational and epidemiological series *[Guideline]*.

   In the first one to three days after discontinuation of warfarin therapy, the coagulation status (reflected primarily by factor II and X levels) may not be adequate for hemostasis despite a decrease in the INR (indicating a return of factor VII activity). The ASRA guideline recommends that the anticoagulant therapy must be stopped (ideally four to five days before the planned procedure) and the

INR must be normalized before initiation of neuraxial block. This recommendation is based on general agreement on efficacy from observational and epidemiological series *[Guideline]*.

5. Postoperative warfarin:
   As thromboprophylaxis with warfarin is initiated, the ASRA guideline suggests that neuraxial catheters should be removed when the INR is less than 1.5. This value was derived from studies correlating hemostasis with clotting factor activity levels greater than 40%. The ASRA (2010) guideline also suggests that neurologic assessment be continued for at least 24 hours after catheter removal for these patients. These comments represent mere suggestions, rather than recommendations, because suggestions are based on general consensus that there is conflicting evidence or opinion from case reports or expert opinion.

   In patients with INR greater than 1.5 but less than 3, it is recommended that removal of indwelling catheters should be done with caution and the medication record reviewed for other medications that may influence hemostasis that may not affect the INR (e.g., NSAIDs, aspirin, clopidogrel, ticlopidine, UFH, LMWH). This recommendation is derived from case reports or expert opinion with conflicting evidence or opinion on the usefulness of the information. ASRA recommends that neurologic status be assessed before catheter removal and continued until the INR has stabilized at the desired prophylaxis level. This recommendation is based on general agreement from information derived from case reports and expert opinion.

   In patients with an INR greater than three, ASRA recommends that the warfarin dose be held or reduced in patients with indwelling neuraxial catheters. This recommendation is based on general agreement in the efficacy of either randomized clinical trials or meta-analysis. Due to conflicting evidence or opinion on the usefulness of the information from case reports or expert opinion, ASRA made no definitive recommendation regarding management to facilitate removal of neuraxial catheters in patients with therapeutic levels of anticoagulation during neuraxial catheter infusion *[Guideline]*.

6. Postoperative LMWHs:
   Patients who will receive postoperative LMWH thromboprophylaxis may safely undergo single-injection and continuous catheter techniques. The management of these patients is based on total daily dose, dosing schedule and the timing of the first postoperative dose. The following recommendations are based on general agreement from case reports and/or expert opinion *[Guideline]*.

   Single-Daily Dosing

   The first postoperative LMWH dose should be administered 6 to 8 hours postoperatively. The second postoperative dose should occur no sooner than 24 hours after the first dose. Indwelling neuraxial catheters may be safely maintained. However, the catheter should be removed a minimum of 10 to 12 hours after the last dose of LMWH. Subsequent LMWH dosing should occur a minimum of four hours after catheter removal. No additional hemostasis-altering medications should be administered, due to the additive effects *[Guideline]*.

   Twice-daily dosing

   This dosage regimen is associated with an increased risk of spinal hematoma. The first dose of LMWH should be administered no earlier than 24 hours postoperatively, regardless of anesthetic technique, and only in the presence of adequate (surgical) hemostasis. Indwelling catheters should be removed before initiation of LMWH thromboprophylaxis. If a continuous technique is selected, the epidural catheter may be left indwelling overnight but must be removed before the first dose of LMWH. Administration of LMWH should be delayed for four hours after catheter removal *[Guideline]*.

Definitions:

Following a review of several evidence rating and recommendation writing systems, Institute for Clinical System Improvement (ICSI) has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Crosswalk between ICSI Evidence Grading System and GRADE

ICSI GRADE System	Previous ICSI System	
High, if no limitation	Class A:	Randomized, controlled trial
Low		

ICSI GRADE System	Previous ICSI System	
	Class B:	[observational]
		Cohort study
	Class C:	[observational]
		Non-randomized trial with concurrent or historical controls
Low		Case-control study
Low		Population-based descriptive study
*Low		Study of sensitivity and specificity of a diagnostic test
*Following individual study review, may be elevated to Moderate or High depending upon study design		
	Class D:	[observational]
Low		Cross-sectional study
		Case series
		Case report
Meta-analysis	Class M:	Meta-analysis
Systematic Review		Systematic review
Decision Analysis		Decision analysis
Cost-Effectiveness Analysis		Cost-effectiveness analysis
Low	Class R:	Consensus statement
Low		Consensus report
Low		Narrative review
Guideline	Class R:	Guideline
Low	Class X:	Medical opinion

Evidence Definitions

High Quality Evidence = Further research is very unlikely to change confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

In addition to evidence that is graded and used to formulate recommendations, additional pieces of literature will be used to inform the reader of other topics of interest. This literature is not given an evidence grade and is instead identified as a Reference throughout the document.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Venous thromboembolism

Guideline Category

Prevention

Risk Assessment

Clinical Specialty

Anesthesiology

Cardiology

Emergency Medicine

Family Practice

Hematology

Internal Medicine

Obstetrics and Gynecology

Orthopedic Surgery

Plastic Surgery

Preventive Medicine

Pulmonary Medicine

Surgery

Thoracic Surgery

Urology

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Health Plans

Hospitals

Managed Care Organizations

Nurses

Pharmacists

Physician Assistants

Physicians

Guideline Objective(s)

- To provide clinicians with strategies to reduce morbidity and mortality related to venous thromboembolism events of adult hospitalized patients
- To help clinicians address the Triple Aim: optimization of population health, patient experience, and total cost of care
- To increase the percentage of hospitalized patients 18 years of age and older who are assessed for venous thromboembolism risk within 24 hours of admission
- To increase the percentage of hospitalized patients 18 years of age and older who are evaluated for venous thromboembolism prophylaxis upon change in level of care, providers, and/or upon discharge
- To increase the percentage of hospitalized patients 18 years of age and older at risk for venous thromboembolism who have received education within 24 hours of admission into inpatient care setting for venous thromboembolism that includes venous thromboembolism risk, signs and symptoms, early and frequent mobilization, and clinically appropriate treatment/prophylaxis methods
- To improve the safety of using medications by reducing the likelihood of patient harm associated with the use of anticoagulation therapy in inpatient care setting for patients 18 years of age and older
- To increase the percentage of at-risk hospitalized patients 18 years of age and older receiving appropriate prophylaxis treatment within 24 hours of admission
- To reduce the risk of complications from pharmacologic prophylaxis for hospitalized and discharged patients 18 years of age and older
- To increase the percentage of surgery patients 18 years of age and older who receive appropriate venous thromboembolism prophylaxis within 24 hours prior to anesthesia start-time to 24 hours after anesthesia end-time.

Target Population

Adult (18 years of age and older) hospitalized patients

Interventions and Practices Considered

1. Assessment of venous thromboembolism risk factors
2. Patient education and early ambulation
3. Mechanical thromboprophylaxis (intermittent pneumatic compression, graduated compression stockings)
4. Pharmacologic prophylaxis (unfractionated heparin, low-molecular-weight heparin, fondaparinux, warfarin, aspirin, apixaban, dabigatran, rivaroxaban)
5. Special situations
    - Prophylaxis for hospitalized non-surgical (medical) patients
    - Prophylaxis for non-orthopedic general and abdominal pelvic surgery (gastrointestinal, urological, bariatric, vascular, plastic or reconstructive, cardiothoracic and gynecologic surgery)
    - Prophylaxis for hip/knee arthroplasty and hip fracture
    - Evaluation of patients for major bleeding complications and heparin-induced thrombocytopenia
    - Neuroaxial blockade in patients receiving thromboprophylaxis

Major Outcomes Considered

- Morbidity and mortality related to venous thromboembolism (VTE) or VTE prophylaxis
- Quality of life

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

A consistent and defined process is used for literature search and review for the development and revision of Institute for Clinical Systems Improvement (ICSI) guidelines. Literature search terms for the current revision of this document include venous thromboembolism prevention and control, aspirin, hip arthroplasty, knee arthroplasty, low-molecular-weight heparin, risk stratification/factors, graduated compression stockings, pneumatic compression, systematic reviews, burns, thoracic surgery, trauma, neurosurgery outpatient, regional anesthesia. Formal searches in PubMed spanned the time frame 18 months prior to the start of the revision from 1/1/2011 through 1/30/2012. Additionally, ICSI Venous Thromboembolism Prophylaxis work group members brought forth a wide variety of articles to include. Publication dates went back two years from this publication date. Excluded were non-English, non-human and age less than 18. Databases included PubMed and Cochrane reviews.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Following a review of several evidence rating and recommendation writing systems, Institute for Clinical System Improvement (ICSI) has made a decision to transition to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Crosswalk between ICSI Evidence Grading System and GRADE

ICSI GRADE System	Previous ICSI System	
High, if no limitation	Class A:	Randomized, controlled trial
Low	Class B:	[observational]
		Cohort study
	Class C:	[observational]
		Non-randomized trial with concurrent or historical controls
Low		Case-control study
Low		Population-based descriptive study

ICSI GRADE System	Previous ICSI System	
*Low		Study of sensitivity and specificity of a diagnostic test
*Following individual study review, may be elevated to Moderate or High depending upon study design		
	Class D:	[observational]
Low		Cross-sectional study
		Case series
		Case report
Meta-analysis	Class M:	Meta-analysis
Systematic Review		Systematic review
Decision Analysis		Decision analysis
Cost-Effectiveness Analysis		Cost-effectiveness analysis
Low	Class R:	Consensus statement
Low		Consensus report
Low		Narrative review
Guideline	Class R:	Guideline
Low	Class X:	Medical opinion

Evidence Definitions

High Quality Evidence = Further research is very unlikely to change confidence in the estimate of effect.

Moderate Quality Evidence = Further research is likely to have an important impact on confidence in the estimate of effect and may change the estimate.

Low Quality Evidence = Further research is very likely to have an important impact on confidence in the estimate of effect and is likely to change the estimate or any estimate of effect is very uncertain.

In addition to evidence that is graded and used to formulate recommendations, additional pieces of literature will be used to inform the reader of other topics of interest. This literature is not given an evidence grade and is instead identified as a Reference throughout the document.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

New Guideline Development Process

A work group consisting of 6 to 12 members that includes physicians, nurses, pharmacists, and other healthcare professionals relevant to the topic, along with an Institute for Clinical Systems Improvement (ICSI) staff facilitator develops each document. Ordinarily, one of the physicians will be the leader. Most work group members are recruited from ICSI member organizations, but if there is expertise not represented by ICSI members, 1 or 2 members may be recruited from medical groups, hospitals, or other organizations that are not members of ICSI. Patients on occasion are invited to serve on work groups.

The work group will meet for 7 to 8 three-hour meetings to develop the guideline. A literature search and review is performed and the work group members, under the coordination of the ICSI staff facilitator, develop the algorithm and write the annotations and footnotes and literature citations.

Once the final draft copy of the guideline is developed, the guideline goes to the ICSI members for critical review.

Revision Process of Existing Guidelines

ICSI scientific documents are revised every 12 to 24 months as indicated by changes in clinical practice and literature. For documents that are revised on a 24-month schedule, ICSI checks with the work group on an annual basis to determine if there have been changes in the literature significant enough to cause the document to be revised earlier or later than scheduled.

For yearly reviewed documents, ICSI checks with every work group 6 months before the scheduled revision to determine if there have been changes in the literature significant enough to cause the document to be revised earlier than scheduled.

Literature Search

ICSI staff, working with the work group to identify any new pertinent clinical trials, systematic reviews, or regulatory statements and other professional guidelines, conduct a literature search.

Revision

The work group will meet for 1 to 2 three-hour meetings to review the literature, respond to member organization comments, and revise the document as appropriate.

A second review by members is indicated if there are changes or additions to the document that would be unfamiliar or unacceptable to member organizations. If a review by members is not needed, the document goes to the appropriate steering committee for approval according to the criteria outlined above.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Critical Review Process

The purpose of critical review is to provide an opportunity for the clinicians in the member groups to review the science behind the recommendations and focus on the content of the guideline. Critical review also provides an opportunity for clinicians in each group to come to consensus on feedback they wish to give the work group and to consider changes necessary across systems in their organization to implement the guideline.

All member organizations are expected to respond to critical review guidelines. Critical review of guidelines is a criterion for continued membership within the Institute for Clinical Systems Improvement (ICSI).

After the critical review period, the guideline work group reconvenes to review the comments and make changes, as appropriate. The work group prepares a written response to all comments.

Document Approval

Each document is approved by the Committee for Evidence-Based Practice (CEBP). The committee will review and approve each guideline/protocol, based on the following criteria:

- The aim(s) of the document is clearly and specifically described.
- The need for and importance of the document is clearly stated.
- The work group included individuals from all relevant professional groups and had the needed expertise.
- Patient views and preferences were sought and included.
- The work group has responded to all feedback and criticisms reasonably.
- Potential conflicts of interest were disclosed and do not detract from the quality of the document.
- Systematic methods were used to search for the evidence to assure completeness and currency.
- Health benefits, side effects, risks and patient preferences have been considered in formulating recommendations.
- The link between the recommendation and supporting evidence is clear.
- Where the evidence has not been well established, recommendations based on community practice or expert opinion are clearly identified.
- Recommendations are specific and unambiguous.
- Different options for clinical management are clearly presented.
- Clinical highlights and recommendations are easily identifiable.
- Implementation recommendations identify key strategies for *health care systems* to support implementation of the document.
- The document is supported with practical and useful tools to ease *clinician* implementation.
- Where local resource availability may vary, alternative recommendations are clear.
- Suggested measures are clear and useful for quality/process improvement efforts.

Once the document has been approved, it is posted on the ICSI Web site and released to members for use.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for selected recommendations (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate use of venous thromboembolism prophylaxis to reduce all-cause mortality and/or morbidity associated with surgical procedures and/or hospitalization

Potential Harms

Side Effects of Anticoagulant Medications

- Bleeding (major and minor)
- There is concern about an increased risk of perispinal hematoma in patients receiving antithrombotic medications for venous thromboembolism prophylaxis in the setting of neuraxial blockade. Perispinal hematoma is a rare but serious complication of neuraxial blockade. Thus, it is important to consider both the use and the timing of antithrombotic medications in these patients.
- Heparin-induced thrombocytopenia (HIT) is a potential side effect of heparin and low-molecular-weight heparin (LMWH) therapy. Postoperative patients and patients receiving unfractionated heparin (UFH) are at the highest risk of developing this complication.

Side Effects of Mechanical Methods of Venous Thromboembolic Prophylaxis

Mechanical prophylaxis devices can have harmful consequences, most commonly related to skin irritation and breakdown.

Contraindications

Contraindications

- Neuraxial blockade should generally be avoided in patients with a clinical bleeding disorder.
- Pradaxa is not approved for patients with atrial fibrillation caused by heart valve problems. The U.S. Food and Drug Administration (FDA) is requiring a contraindication (a warning against use) of Pradaxa in patients with mechanical heart valves.

Qualifying Statements

Qualifying Statements

- The information contained in this Institute for Clinical Systems Improvement (ICSI) Health Care Guideline is intended primarily for health professionals and other expert audiences.
- This ICSI Health Care Guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients and families are urged to consult a health care professional regarding their own situation and any specific medical questions they may have. In addition, they should seek assistance from a health care professional in interpreting this ICSI Health Care Guideline and applying it in their individual case.
- This ICSI Health Care Guideline is designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and is not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition.

Implementation of the Guideline

Description of Implementation Strategy

Once a guideline is approved for release, a member group can choose to concentrate on the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment, and tobacco cessation.

Detailed measurement strategies are presented in the original guideline document to help close the gap between clinical practice and the guideline recommendations. Summaries of the measures are provided in the National Quality Measures Clearinghouse (NQMC).

Implementation Recommendations

Prior to implementation, it is important to consider current organizational infrastructure that addresses the following:

- System and process design
- Training and education
- Culture and the need to shift values, beliefs and behaviors of the organization

The following system changes were identified by the guideline work group as key strategies for health care systems to incorporate in support of the implementation of this guideline.

- Implement a defined anticoagulation management program to individualize the care provided to each patient receiving anticoagulation therapy.
- (Clinics and Hospitals): Develop systems for monitoring the effects of anticoagulation therapy (heparin, low-molecular-weight heparin, warfarin and other anticoagulants) to include monitoring of outpatient therapy:
    - Use of standardized practices/protocols that include patient involvement.
- When heparin is administered intravenously and continuously, the organization should use programmable infusion pumps.
- Develop systems for providing patient/family education that includes the importance of follow-up monitoring, compliance issues, dietary restrictions, and potential adverse drug reactions and interactions.
    - Patient education to include documentation of the patient's own awareness of his/her risk for venous thromboembolism, signs and symptoms of venous thromboembolism, activity level, when/how to seek treatment, and demonstrated understanding of the prescribed anticoagulation regimen.
    - The Institute for Clinical Systems Improvement (ICSI) work group gleaned the following perspectives and insights from ICSI's Patient Advisory Council in June 2012.
    - Patients stated the following attributes would be important for effective delivery of information about venous thromboembolism (VTE) prophylaxis to the hospitalized medical patient:
        - Patients prefer that a clinician, preferably a physician, deliver prophylaxis information, in a compassionate and clear manner that can be understood by a layperson. Accompanying this with supporting material such as a visual aid in video format would be ideal. Written material might be saved for later but is not preferred at initial contact.
        - The medically ill patient may not be able to comprehend or retain information given his or her condition so it is important to involve an advocate such as a family member.
        - Since the prophylaxis is not related to the primary treatment plan or reason for admission, patients would prefer that the clinician guide the decision by indicating whether he or she strongly recommends it or not. It is better received if the positive benefits of the treatment are stressed along with the fact it is a routine practice or standard of care.
        - If a cost will be incurred by the patient, he or she appreciates knowing that to assist decision-making.

    As to elective surgical procedures, patients indicated that they preferred to get the information from the surgeon during the preoperative evaluation process.

- Develop a policy for providing organizational education regarding anticoagulation therapy to prescriber(s), staff, patients and families.
- Develop protocols for the initiation and maintenance of anticoagulation therapy appropriate to the medication used, to the condition being treated, and to the potential for drug interactions.

See Appendix A, "Improvement Strategies," in the original guideline document for additional information on implementation.

Implementation Tools

Quality Measures

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Related NQMC Measures

Venous thromboembolism (VTE) prophylaxis: percentage of adult hospitalized patients who have a VTE risk assessment within 24 hours of admission.

Venous thromboembolism (VTE) prophylaxis: percentage of hospitalized patients who are evaluated for VTE prophylaxis upon referral or transfer

to another setting, service, practitioner or level of care within or outside the organization.

Venous thromboembolism (VTE) prophylaxis: percentage of hospitalized patients at risk for VTE who have VTE education within 24 hours of admission that includes 1) VTE risk, 2) signs and symptoms, 3) early and frequent mobilization, and 4) clinically appropriate treatment/prophylaxis methods.

Venous thromboembolism (VTE) prophylaxis: percentage of hospitalized patients who have a baseline international normalized ratio when initially prescribed warfarin.

Venous thromboembolism (VTE) prophylaxis: percentage of hospitalized patients on warfarin for whom current international normalized ratio is used to monitor and adjust therapy.

Venous thromboembolism (VTE) prophylaxis: percentage of hospitalized patients on prescribed heparin or low-molecular-weight heparin who have appropriate baseline laboratory tests documented.

Venous thromboembolism (VTE) prophylaxis: percentage of adult hospitalized patients on prescribed heparin or low-molecular-weight heparin who have appropriate ongoing laboratory tests drawn and used to adjust therapy.

Venous thromboembolism (VTE) prophylaxis: percentage of adult hospitalized patients receiving heparin therapy for VTE prophylaxis who have a baseline platelet count before starting heparin and then a platelet count every other day over the course of 14 days.

Venous thromboembolism (VTE) prophylaxis: percentage of adult hospitalized patients with creatinine clearance less than 30 mL/min in the medical record who receive a reduced dose of anticoagulation therapy.

Venous thromboembolism (VTE) prophylaxis: percentage of discharged patients who are readmitted to the hospital with VTE within 30 days of discharge.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Safety

Identifying Information and Availability

Bibliographic Source(s)

Jobin S, Kalliainen L, Adebayo L, Agarwal Z, Card R, Christie B, Haland T, Hartmark M, Johnson P, Kang M, Lindvall B, Mohsin S, Morton C. Venous thromboembolism prophylaxis. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2012 Nov. 51 p. [22 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2003 Nov (revised 2012 Nov)

Guideline Developer(s)

Institute for Clinical Systems Improvement - Nonprofit Organization

Guideline Developer Comment

Organizations participating in the Institute for Clinical Systems Improvement (ICSI): Affiliated Community Medical Centers; Allina Medical Clinic; Aspen Medical Group; Baldwin Area Medical Center; Brown Clinic; Center for Diagnostic Imaging/Medical Scanning Consultants; CentraCare; Central Lakes Medical Clinic; Chippewa County – Montevideo Hospital & Clinic; Cuyuna Regional Medical Center; Essentia Health; Fairview Health Services; Family HealthServices Minnesota; Family Practice Medical Center; Fergus Falls Medical Clinic; Gillette Children's Specialty Healthcare; Grand Itasca Clinic and Hospital; Hamm Clinic; HealthEast Care System; HealthPartners Central Minnesota Clinics; HealthPartners Medical Group & Regions Hospital; Hennepin County Medical Center; Hennepin Faculty Associates; Howard Young Medical Center; Hudson Physicians; Hutchinson Area Health Care; Hutchinson Medical Center; Integrity Health Network; Lake Region Healthcare Corporation; Lakeview Clinic; Mankato Clinic; MAPS Medical Pain Clinics; Marshfield Clinic; Mayo Clinic; Mercy Hospital and Health Care Center; Midwest Spine Institute; Minnesota Association of Community Health Centers; Minnesota Gastroenterology; Multicare Associates; New Richmond Clinic; North Central Heart Institute; North Clinic; North Memorial Health Care; Northwest Family Physicians; Obstetrics and Gynecology Specialists; Olmsted Medical Center; Park Nicollet Health Services; Planned Parenthood Minnesota, North Dakota, South Dakota; Quello Clinic; Raiter Clinic; Rice Memorial Hospital; Ridgeview Medical Center; River Falls Medical Clinic; Riverwood Healthcare Center; South Lake Pediatrics; Southside Community Health Services; Stillwater Medical Group; University of Minnesota Physicians; Winona Health

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Source(s) of Funding

- The Institute for Clinical Systems Improvement (ICSI) provided the funding for this guideline. The annual dues of the member medical groups and sponsoring health plans fund ICSI's work. Individuals on the work group are not paid by ICSI, but are supported by their medical group for this work.
- ICSI facilitates and coordinates the guideline development and revision process. ICSI, member medical groups, and sponsoring health plans review and provide feedback but do not have editorial control over the work group. All recommendations are based on the work group's independent evaluation of the evidence

Guideline Committee

Venous Thromboembolism Prophylaxis Work Group

Composition of Group That Authored the Guideline

Work Group Members: Sherri Jobin, PharmD, BCPS (*Work Group Co-Leader*) (HealthEast Care System); Loree K. Kalliainen, MD, MA (*Work Group Co-Leader*) (HealthPartners Medical Group and Regions Hospital) (Plastic Surgeon); Randall Card, MD (Cuyuna Regional Medical Center) (Family Medicine); Beverly Christie, RN, DNP, PHN (Fairview Health Services) (Quality and Patient Safety); Martina E. Hartmark, MD (HealthPartners Medical Group and Regions Hospital) (Internal Medicine); Matthew Kang, MD (HealthPartners Medical Group and Regions Hospital) (Neurosurgery); Salma Mohsin, MD (HealthPartners Medical Group and Regions Hospital) (Hospitalist); Colleen Morton,

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Financial Disclosures/Conflicts of Interest

The Institute for Clinical Systems Improvement (ICSI) has long had a policy of transparency in declaring potential conflicting and competing interests of all individuals who participate in the development, revision and approval of ICSI guidelines and protocols.

In 2010, the ICSI Conflict of Interest Review Committee was established by the Board of Directors to review all disclosures and make recommendations to the board when steps should be taken to mitigate potential conflicts of interest, including recommendations regarding removal of work group members. This committee has adopted the Institute of Medicine Conflict of Interest standards as outlined in the report Clinical Practice Guidelines We Can Trust (2011).

Where there are work group members with identified potential conflicts, these are disclosed and discussed at the initial work group meeting. These members are expected to recuse themselves from related discussions or authorship of related recommendations, as directed by the Conflict of Interest committee or requested by the work group.

The complete ICSI policy regarding Conflicts of Interest is available at the ICSI Web site .

Disclosure of Potential Conflicts of Interest

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Guideline-Related Activities: ICSI Pre-Operative Evaluation Guideline
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Financial/Non-Financial Conflicts of Interest: None

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Financial/Non-Financial Conflicts of Interest: None

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Research Grants: None
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Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

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Research Grants: None
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Research Grants: Worked on behalf of her organization on grants with the Plastic Surgery Foundation and NIH
Financial/Non-Financial Conflicts of Interest: None

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Guideline-Related Activities: ICSI Antithrombotic Therapy Supplement
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

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Guideline-Related Activities: None
Research Grants: None
Financial/Non-Financial Conflicts of Interest: None

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Institute for Clinical Systems Improvement (ICSI). Venous thromboembolism prophylaxis. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2011 Sep. 47 p.

Guideline Availability

Electronic copies: Available from the Institute for Clinical Systems Improvement (ICSI) Web site .

Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org ; e-mail: icsi.info@icsi.org.

Availability of Companion Documents

The following is available:

- Venous thromboembolism prophylaxis. Executive summary. Bloomington (MN): Institute for Clinical Systems Improvement, 2012 Nov. 1 p. Electronic copies: Available from the Institute for Clinical Systems Improvement (ICSI) Web site .

Print copies: Available from ICSI, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org ; e-mail: icsi.info@icsi.org.

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on April 29, 2004. It was updated by ECRI on September 16, 2005, and September 18, 2006. This summary was updated by ECRI on March 6, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Coumadin (warfarin sodium). This summary was updated by ECRI Institute on June 22, 2007 following the U.S. Food and Drug Administration (FDA) advisory on heparin sodium injection. This NGC summary was updated by ECRI Institute most recently on September 11, 2007. This NGC summary was updated by ECRI Institute on March 14, 2008 following the updated FDA advisory on heparin sodium injection. This NGC summary was updated by ECRI Institute on April 16, 2009. This summary was updated by ECRI Institute on November 2, 2010. This NGC summary was updated by ECRI Institute on January 13, 2012. This NGC summary was updated by ECRI Institute on February 8, 2012. This summary was updated by ECRI Institute on March 10, 2014 following the U.S. Food and Drug Administration advisory on Low Molecular Weight Heparins.

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